The cleansing effect of minimum wage
Minimum wage rules, firm dynamics and aggregate productivity in China

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First draft: February, 2014 This version: August 28, 2014

Abstract

We study how Chinese firms adjust to a rise in minimum wages and how this af-

1 Introduction

Can higher minimum wages ensure that economic development bene ts the poorest without hurting the growth process itself? The question is controversial in both academic and policy circles. The recent riots in Bangladesh or Cambodia show that the social demand for a better distribution of growth bene ts is high in developing countries. In China, polls reveal that concerns about inequality have grown as \roughly eight-in-ten have the view that the rich just get richer while the poor get poorer" (Pewresearch Center, 2012). The debate is also hot in developed economies: renowned politicians and economists have called for a signi cant rise of minimum wages in the U.S. (Woellert, 2014), as well as Barack Obama in his 2014 State of the Union address. On the other hand, any attempt by authorities to increase wage standards receives the opposition of employer federations. They argue that wage increases will erode their margins, forcing them to re workers or to relocate entirely their activities in countries with lower wages. The American Chamber of Commerce states for example on its Philippine website that \the relentless upward adjustment in the minimum wages in the Philippines has made minimum wages in the Philippines among the highest minimum wages in ASEAN and caused great harm to the country's domestic and export manufacturing sectors".[1]

In this paper we use balance-sheet data for more than 160,000 industrial rms to investigate both the rm-level and the aggregate e ects of higher minimum wages in China, where minimum wages are set at the city-level. Our empirical strategy exploits a reform of the minimum wage rules passed in 2004 that imposes massive but heterogeneous increases in the level of minimum wage across Chinese cities; it combines a triple di erence approach with instrumental variables. We show that the 2004 reform is really binding: the share of Chinese rms complying with the local minimum wage or paying wages just above the minimum wage drastically increases after the reform, while no such trend is detected before 2004. Moreover, we nd that a higher minimum wage reduces the survival probability of local rms between 2003 and 2005. However, for surviving rms, wage costs increase without a ecting their employment. The main explanation for this nding is that productivity signi cantly improves, allowing rms to absorb the cost shock without hurting employment nor pro tability. We show that these results cannot be accounted for by competing explanations. In particular, substitution of incumbent workers by less-paid/less protected migrants does not seem to be at play. At the city-level, our results suggest that the overall e ect of these rm-level adjustments for manufacturing employment is null, entries compensating exits. Moreover, higher minimum wages foster aggregate productivity growth thanks to productivity improvements among incumbent rms and net entry of more productive ones.

Hence, in a fast-growing economy like China, there is a cleansing e ect of labor market standards. Minimum wage growth allows more productive rms to replace the least productive ones and forces incumbent rms to strengthen their competitiveness, these two mechanisms boosting the aggregate e ciency of the economy. The e ects we measure are economically large. Minimum wage growth between 2003 and 2005 explains on average 20% of rm-level and city-level productivity gains in China over the period.

China is a highly relevant case for several reasons. First, China, the fastest growing economy of the past fteen years, has become a key player of the global economy; understanding the determinants of its competitiveness and of its industrial dynamics is thus interesting for both developed and developing countries. Moreover, China is the show case in terms of low wages: in 2004, the average monthly wage in manufacturing was equal to 141 dollars in China, versus 342 dollars in Mexico and more than 2,500 dollars in the US.

from these studies by using much more detailed data: we directly link firm-level outcomes to changes in the local minimum wage. Closest to our study is the firm-level study of Huang et al. (2014) on the link between local minimum wage and employment. While our results are consistent with their finding of an overall very modest effect of minimum wage on employment, our work is different along two important dimensions: we focus on the 2004 reform, which allows us to propose an original instrumentation strategy to carefully address endogeneity issues the studies on minimum wage usually suffer from, and we do not only focus on employment.

By investigating other firm-level outcomes, our work tries to understand why higher minimum wages might not necessarily be associated with lower firm-level or aggregate employment. Indeed, firms have different ways to adapt to an increase in the level of the minimum wage. Reductions in labor turnover or in profits, improvements in firm-level efficiency or small price increases could limit employment losses for example (Schmitt, 2013; Hirsch et al., 2011). However, rigorous empirical evidence on these channels is scarce (at the notable exception of Draca et al., 2011, who show that British firms absorb the shock induced by the introduction of a national minimum wage in 1999 by reducing their profit margins).[7] In this paper, we propose a careful evaluation of the many ways Chinese firms adjusted to the changes imposed by the 2004 reform, including survival, number of employees, productivity and profitability.

Third, we provide an in-depth analysis of the effect of minimum wage on the various margins of city-level productivity growth. To the best of our knowledge, this is the first paper to investigate how firm-level adjustments to minimum wage shape aggregate outcomes. Doing so, we contribute to the analysis of the determinants of aggregate efficiency in developing countries. Both firm-level inefficiencies and misallocation of resources across firms have been emphasized as major explanations for the lower aggregate TFP in developing countries (Hsieh and Klenow, 2009). Regarding the first channel, several recent papers show that there is a fixed cost to adopt better practices/technologies (Bloom et al., 2013; Duflo et al., 2011).[8] Regarding the second channel, Hsieh and Klenow (2009) show that misallocation might be an important source of inefficiency in developing countries; they find that reallocating production factors across firms so as to equalize marginal products to the same

wage panel data with a longitudinal household survey.

[7] However, Draca et al. (2011) fail to identify firm-level adjustments in terms of productivity.

[8] Thanks to a randomized experiment, Bloom et al. (2013) show that adopting better management practices significantly increases firm-level productivity of Indian textile firms. The experience suggests that informational barriers, but also procrastination, prevent firms from adopting the best management practices.

2.1 Characteristics of the 2004 minimum wage reform

Minimum wage requirements were first imposed in China in 1993 following the ratification by the country of the International Labor Organization Convention No. 26. However, the 1993 rules did not really cover migrants and penalties in case of non-enforcement were quite low. In the 1990s, minimum wage rules were thus hardly binding in China.

In March 2004, the Rules for Minimum Wages (2004 Rules) take effect. They extend minimum wage coverage to migrant workers, and penalties in case of non-enforcement are dramatically increased. One of the explicit aims of the reform is to increase living standards. As different parts of the country have very different living standards, China does not have a unique minimum wage level for the entire nation. Minimum wages are set following a decision process that involves both national and local authorities. Each province, municipality, autonomous region, and even each district sets its own minimum wage level according to both local conditions and national guidelines. Typically, following national requirements, provincial governments set out multiple minimum wage classes for the region as a whole, and each city and county within the region chooses the appropriate minimum wage level based on its own local economic conditions and living standards. For example, in its latest round of minimum wage increases, Zhejiang set out four minimum wage classes for the entire province, with some top-tier cities such as Hangzhou, Ningbo and Wenzhou choosing the highest minimum wage standard (Class A), while other cities, including Jiaxin, Jinhua and Taizhou settled on the next-highest minimum wage level (Class B).

The fact that municipalities can adjust the level of the minimum wage to local economic conditions (distribution of wages, evolution of living costs and prices but also level of economic development and employment dynamics) ensures spatial variations in the level of minimum wages but gives rise to an endogeneity problem which jeopardizes our capacity to assess the causal effect of minimum wage growth; however, the existence of national guidelines is interesting since it allows to develop instruments to solve this potential endogeneity issue. Crucial for our analysis, the 2004 Rules expressly promote the convergence of minimum wages across localities, imposing unprecedented large increases in minimum wages where they were initially the lowest. As a guideline, the 2004 Rules state that local minimum wage for full-time employees should fall within a range of 40-60% of the monthly local average wage. This range is quite close to what we observe in several developed countries: in 2011 in France, the monthly minimum wage is roughly equal to 1,100 euros, the average wage being roughly twice higher, at 2,100 euros,[10] while in the US these figures are equal to 1,250 dollars and 3,600 dollars respectively.[11] As will appear clearly in Section 4, we will

[10] See http://www.insee.fr/fr/bases-de-donnees/bsweb/serie.asp?idbank=000879878 and http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATTEF04155

[11] See http://www.ssa.gov/oact/cola/AWI.html and poverty.ucdavis.edu/faq/

exploit these national guidelines as instruments for the growth rate of local minimum wage in our empirical strategy.

2.2 Which e ects can we theoretically expect from an increase in the level of the minimum wage?

An increase in the level of the minimum wage represents a cost shock for rms (potentially both in terms of xed and marginal costs of production). Depending on the theoretical framework we have in mind, this shock can have various e ects for rms.

In a perfectly competitive framework where the marginal productivity of labor is decreasing and where wages are equal to the marginal productivity of labor, a minimum wage increase should translate into a reduction in the number of workers employed by rms. Moreover, some rms may not be able to sell enough anymore to cover the xed production cost and will have to shut down.

Predictions would be quite similar in a model where rms are heterogeneous in terms of productivity and compete monopolistically. Firms will entirely pass the higher marginal cost into higher prices for consumers. The overall demand will decrease and the least productive rms will be forced to exit the market, since they will not be able to cover the xed production cost anymore.

These rm-level adjustments should generate unemployment, the labor demand decreasing while wages cannot adjust downward. In case workers are heterogeneous, greater adverse repercussions from layo s are expected for the workers with the lowest skills and/or the lowest productivity.

However, several mechanisms could mitigate the disemployment e ects of a minimum wage increase.

In set-ups featuring e ciency wage, an increase in the level of the minimum wage could improve labor productivity by motivating employees to work harder, allowing rms to absorb the cost shock. Also, when workers decide to participate to the labor market and choose their employer depending on the level of an outside option, an increase in the level of minimum wage might not necessarily hurt employment thanks to greater labor market participation or lower turnover of workers within rms. Also, in imperfect competition models with variable markups, rms might partly absorb the cost shock by reducing their pro t margin. Draca et al. (2011) focus on the minimum wage in the UK and nd results consistent with this prior.

Finally, a minimum wage increase could also foster rm-level e ciency gains. Let's assume that rms have to choose among two production processes, a high-tech one with low constant marginal labor requirement but high xed adoption cost and a low-tech one,

what-are-annual-earnings-full-time-minimum-wage-worker

Data on minimum wage at the prefecture level are collected from various official websites such as China Labour Net.[14] The data contain monthly minimum wages for full-time employees and hourly minimum wages for part-time employees by city and year. Since we do not have information on the total number of hours worked, the former are used in our regressions.

Macroeconomic indicators at the city-level such as GDP, population, FDI or university students enrollment, used as controls in the aggregate regressions, are taken from China Data Online, provided by the University of Michigan.

3.2 Firm level indicators and summary statistics

All the information we have is at the firm or at the city level. We do not have information at the worker level. To compute firm-level average wage, we thus divide the total firm-level wage bill by the number of employees.

While we use labor productivity as our main productivity measure throughout the paper, we also calculate a firm-level TFP index. To do so, we estimate Cobb-Douglas production functions at the 2-digit industry level following the approach developed by Levinsohn and Petrin (2003). Intermediate inputs are used as a proxy for unobserved variables (entrepreneur characteristics or macroeconomic shocks) that could both determine the level of inputs and the level of output.[15]

We clean the data by excluding observations for which value-added, capital or wage is missing, negative or null, as well as firms smaller than 5 employees since the reported average wage may not be reliable for these firms. In order to avoid measurement issues for the aggregate analysis, we also restrict our attention to localities with at least 20 firms in 2003 and 2005, and for which information on GDP, employment, FDI etc. is available. This leaves us with a sample of 261 cities.

Our final sample contains 167,327 firms active in 2003, out of which 21.5% have an average wage that is below the local minimum wage enforced in 2005. As is usually done in the few papers studying the effects of minimum wage with firm-level data (Harrison and Scorse, 2010; Draca et al., 2011), we define these firms as "exposed" firms, since they are the firms that are certainly the most affected by the minimum wage increase. We discuss below the implications of defining treatment in this way for our estimations.

Table A-1 in Appendix presents statistics on the survival rates and changes in average wage for exposed and non-exposed firms separately. The proportion of firms present in 2003

[14] This website (http://www.labournet.com.cn/) is established by the Ministry of Labour and reports information on national labour and personnel rules.

[15] Results, available upon request, provide credible elasticities. The coefficient on labor is on average lower that what we usually find in the literature, but this is not surprising for a developing country like China where the productivity of workers is quite low.

that survive in 2005 is much lower for exposed rms (66%) than for non-exposed rms (78%). Furthermore, wages rose signi cantly faster between 2003 and 2005 amongst the low-wage exposed rms. Over this period, the growth rate of rm-level average wage is equal to 92 log points in this latter group, while it is equal to 13 log points in the group of rms with a higher initial average wage. The di erence is similar if we analyze the evolution of the median of rm-level average wage within each group. These simple descriptive statistics suggest that there is a negative correlation between \exposure" to the 2004 reform of minimum wage rules and survival, and a positive correlation between \exposure" and the growth-rate of rm-level average wage over the period. Our econometric analysis aims to assess whether these correlations can be interpreted as causal relationships. By contrast note that the average growth rate of minimum wage over the period is roughly the same for exposed and non-exposed rms; this suggests that there is no systematic di erence in the geographic distribution of exposed and non-exposed rms in our sample.

4 Empirical strategy

In this section, we show that the 2004 reform of minimum wage rules in China o ers a very nice quasi-natural experiment to estimate the e ect of minimum wage on rm-level and aggregate outcomes and we then discuss in detail our estimation strategy.

4.1 Why is the 2004 reform a nice experiment to assess the economic e ects of a minimum wage increase?

Most studies on the e ect of minimum wage have to face two main issues. First, it might be di cult to estimate the e ects of a minimum wage increase on rm-level outcomes if these increases are small, or if they occur in all the regions of a country at di erent but close points in time (when minimum wages are set locally). In this latter case, the di erences in minimum wages across locations remain on average stable over time, o ering very short time-spans to estimate any e ect in the data (Meer and West, 2013). This is actually often the case in the US and in the UK.

Another issue, more speci c to developing countries, is the extent to which minimum wage is enforced. Indeed, massive non-compliance may jeopardize the identi cation of the minimum wage e ects (see for example Strobl and Walsh, 2003, in the case of Trinidad and Tobago).

Regarding these two issues, the reform passed in China in 2004 o ers a unique design. First, the reform imposes a massive rise in city-level minimum wages. As shown on Figure 1, city-level minimum wages increase all over the 2000-07 period, with a clear acceleration from 2004 onwards. While the annual growth rate of city-level minimum wages was equal to 6.9% on average between 2000 and 2003, it is equal to 15.5% between 2003 and 2007. The other remarkable feature of the post 2004 evolution of minimum wages is the convergence in the level of minimum wage across cities. The right-hand part of Figure 1 shows that the dispersion of city-level minimum wages is quite stable before 2004, with a coe cient of variation equal to 0.23. However, a strong decrease in this dispersion accompanies the reform passed in 2004, the coe cient of variation decreasing to 0.2 in 2005, and to 0.17 in 2007. This suggests that the acceleration in city-level minimum wage growth that we observe from 2004 onwards is concentrated in cities which had the lowest minimum wages before the reform; this is consistent with the convergence objective explicitly pursued by national authorities when implementing the 2004 reform of the minimum wage. This feature will be particularly useful for our instrumentation strategy.

One might worry that these nominal increases in the level of minimum wages are in reality compensated by in ation, imposing in the end very little pressure on rms. In the absence of city-level price indices, we use provincial price indices to compute city-level real minimum

Figure 1: Evolution of city-level minimum wage

wages. As can be seen on Figure 2, the patterns observed for city-level real minimum wages are very similar to those depicted for nominal ones. City-level real minimum wages increase on average by 6.5% before the 2004 reform and by 12.1% after the reform, this post-reform growth being again clearly concentrated in cities with the lowest initial real minimum wage. In the econometric analysis, we rely on minimum wages expressed in real terms.

Figure 2: Evolution of city-level real minimum wage

Even though a minimum wage exists at the city level, there are two reasons why we could not observe any e ect in the data: the minimum wage might not be enforced, or it might not

be really binding, rm-level wages increasing faster for example than the minimum wage. Enforcement and the degree to which minimum wage is binding are not directly observable. However, several elements tend to show that following the reform, rms are more constrained by minimum wage rules than before.

First, the 2004 reform aimed at increasing rm-level compliance with minimum wage rules by strengthening controls and reinforcing penalties in case of non compliance. Prior to 2004, roughly 88.5% of active rms had an average wage at least equal to the minimum wage imposed in the city where they were located. This share rises to 93.2% after 2004, suggesting that the reform of the minimum wage imposed by the Chinese central government is really accompanied at the local level by a stronger enforcement of the rules.[16]

Moreover, Figure 3 shows that following the 2004 reform, there is a growing concentration of rm-level average wages around the value of the city-level minimum wage. The upper panel displays the distribution of rm-level wages (left quadrant) and the distribution of the ratio

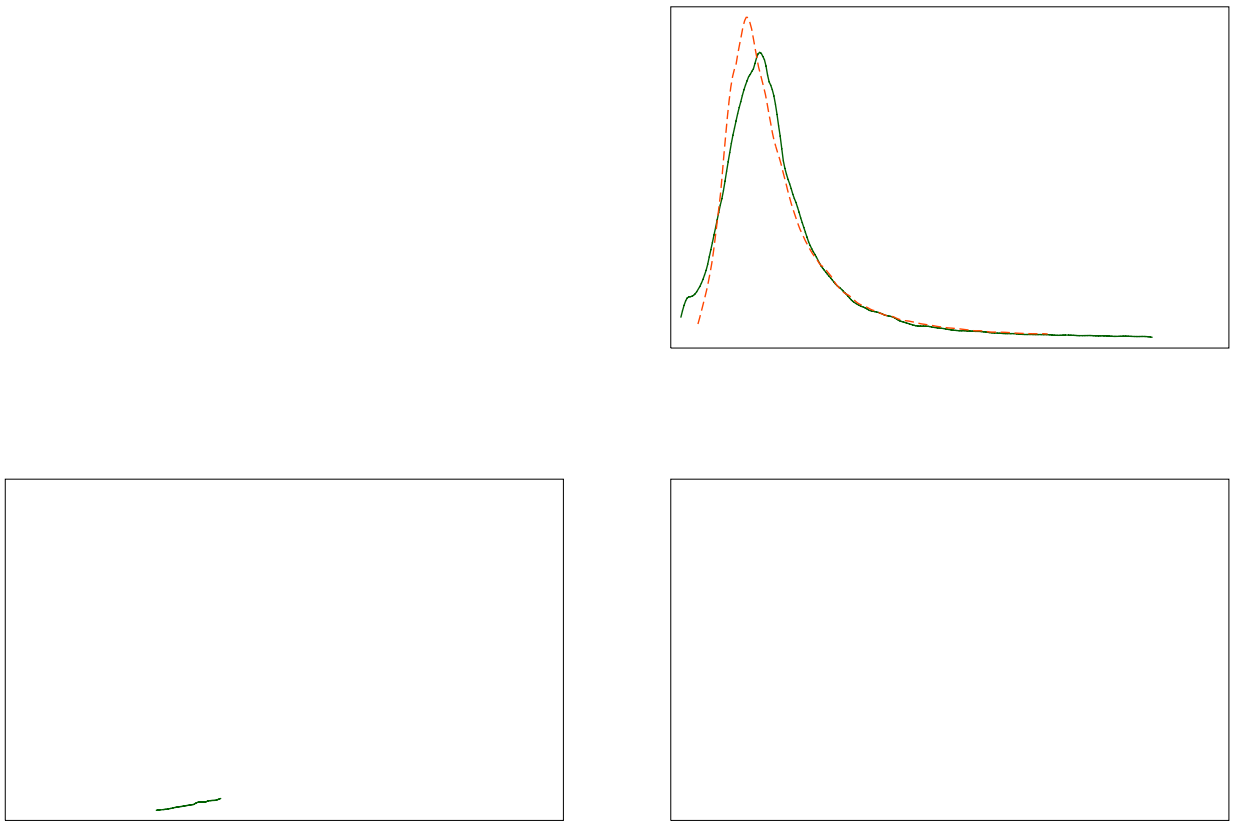

Figure 3: Distribution of rm-level average wage pre and post 2004 reform

to be binding: the share of complying rms increases sharply, as well as the share of rms paying average wages that are just equal or slightly higher than the minimum wage.

4.2 Empirical speci cation and instrumentation

We provide both a micro (rm-level) and a macro (city-level) analysis of the e ect of real minimum wage on economic performance. We present here in detail the estimation strategy for the rm-level analysis, the estimation strategy for city-level outcomes being very similar. From now on, we use the expressions \real minimum wage" and \minimum wage" interchangeably.

Whatever the country under study, assessing the e ect of a minimum wage increase

minimum wage increases will be all the more important that the local economic context is favorable, so as to minimize the potential adverse e ects for rms. Hence, there would be an upward-bias in the estimated impact of minimum wage. This concern is particularly strong for China where municipalities can o cially adapt the level of the minimum wage to their local economic conditions.

In this paper, we focus on the 2003-05 period since it is directly centered around the year the reform of minimum wage rules was passed in China, but our results are robust to alternative periods of time.[17] We de ne as \exposed rms" the rms for which we observe an average wage in 2003 that is lower than the local minimum wage in 2005. Indeed, those rms have no other choice than to increase the wages they o er if they want to comply with the new minimum wage imposed in the city where they are located. Note that we do not have information on wages at the worker-level. Hence, our measure of \exposure" to the reform is potentially noisy: in reality, some so-called \exposed" rms are not exposed to the reform for a fraction of their employees and *vice versa* for \non exposed" rms. However, this is the best way to de ne exposure with rm-level data; this is also the logic of the estimation proposed by Harrison and Scorse (2010) and Draca et al. (2011) in their study on Indonesia and UK, and it represents an improvement as compared to aggregate studies.[18]

We then compare the evolution of rm-level performance for \exposed" and \non-exposed" rms within cities and sectors (thanks to city-sector xed e ects). This strategy helps to

terms of performance. Most previous studies relied on more aggregated data and could not

Table 1: Determinants of city-level minimum wage growth

Explained variable	Ln real minimum wage			
	2003-05		2001-2003	
	(1)	(2)	(3)	(4)
Ln real Minimum wage	-0.298[a]	-0.489[a]	-0.050[c]	-0.096[b]
	(0.040)	(0.052)	(0.026)	(0.039)
Predicted minimum wage growth	0.164[a]	0.089[c]	0.088[a]	0.058[c]
	(0.047)	(0.047)	(0.029)	(0.031)
Ln GDP per capita		0.064[a]		0.007
		(0.015)		(0.012)
Ln population		0.028[b]		0.027[a]
		(0.011)		(0.008)
FDI over GDP		0.025[c]		-0.001
		(0.015)		(0.002)
Ratio of univ. students		-0.001		0.001
over population		(0.001)		(0.001)
R-squared	0.34	0.40	0.06	0.11
Observations	261	261	258	258

Heteroskedasticity-robust standard errors are reported in parentheses. [a], [b] and [c] indicate signi cance at the 1%, 5% and 10% con dence level. All right-hand side variables are measured in 2003 in columns (1) and (2) and in 2001 in columns (3) and (4). Predicted minimum wage growth is equal to the log di erence between 0.4 times the city-level average wage in 2005 (2003) and the city-level minimum wage in 2003 (2001) in the rst (last) two columns.

To be valid, our instruments must not be correlated with business cycles a ecting specifically low-wage rms.[19] Reassuringly, columns (1) and (2) of Table 2 suggest that city-level minimum wage and predicted minimum wage growth do not signi cantly explain low-wage rm employment growth between 2003 and 2005. This contrasts with the results for 2001 03 displayed in columns (3) and (4) of Table 2. City-level minimum wage and predicted minimum wage growth are both positively correlated to the employment dynamics of low-wage rms before the reform. While they are not a formal proof, these results tend to suggest that we cannot reject the exogeneity of our instruments, which will be con rmed by the statistical tests provided in our regression analysis.

All in all, we take these results as evidence that the initial level of minimum wage and

Table 2: Determinants of city-level employment growth in low-wage firms

Explained variable	Ln Employment			
	2003-05		2001-2003	
	(1)	(2)	(3)	(4)
Ln Employment in low-wage firms	-0.159[a]	-0.195[a]	-0.075[b]	-0.077[c]
	(0.033)	(0.044)	(0.037)	(0.045)
Ln real Minimum wage	0.230	0.009	0.301[c]	0.313[c]
	(0.182)	(0.219)	(0.172)	(0.182)
Predicted minimum wage growth	0.201	0.093	0.240[c]	0.242[c]
	(0.142)	(0.181)	(0.133)	(0.135)
Ln GDP per capita		0.102		-0.047
		(0.068)		(0.057)
Ln population		0.039		0.008
		(0.044)		(0.042)
FDI over GDP		0.107[c]		0.051[c]
		(0.060)		(0.028)
Ratio of univ. students over population		-0.001		0.001
		(0.001)		(0.001)
R-squared	0.16	0.18	0.04	0.05
Observations	261	261	258	258

Heteroskedasticity-robust standard errors are reported in parentheses. [a],

is close to a triple difference approach: we compare for a given city-sector the difference in performance growth between exposed and non exposed firms and contrast cities where the real minimum wage grows fast with cities where it increases more slowly.

When transposing Equation (1) to investigate aggregate outcomes, we use the same estimation strategy, but we do not have to rely on interaction terms and we directly instrument minimum wage growth by city-level initial minimum wage and predicted minimum wage growth (controlling for initial characteristics of cities).

5 Firm-level results

We first analyze the effects of minimum wage growth on firm-level performance.

5.1 Baseline results

We report in Table 3 the results from the estimation of Equation (1) when survival is used as the dependent variable.[20] Estimates with Y^f corresponding to average wage, employment and labor productivity are presented in Tables 4, 5 and 6 respectively.

All the tables follow the same pattern. In column (1), we estimate Equation (1) without the dyadic (city-sector) fixed effects; we include sector dummies only. This specification allows us to measure the association between the local minimum wage growth and the evolution of firm-level performance for both exposed and non-exposed firms, controlling for firm-level initial characteristics. Column (2) includes city-sector fixed effects so that we can estimate the effect of minimum wage growth only for exposed firms. Columns (3) and (4) display the two-stage least squares estimates where the change in real minimum wage is instrumented

so that the rm-level repercussions of real minimum wage we capture are not driven by these speci c locations.

The results reported in Table 3 suggest that an increase in the level of the real minimum wage is detrimental to rm survival. More precisely, column (1) shows that bigger and more productive rms, as well as foreign and exporting ones, are more likely to survive. Moreover, controlling for rm-level initial characteristics, the survival probability of non-exposed rms tends to be higher in cities where the minimum wage increases faster: these OLS results are consistent with the idea that the local authorities are more likely to increase the minimum wage in cities where local economic conditions are more favorable. On the contrary, exposed rms su er from the rise in minimum wage: when the minimum wage increases by 10%, their survival probability decreases by 1.4 percentage point as compared to non exposed rms. Introducing city-sector xed e ects in column (2) does not a ect this result, while instrumenting minimum wage growth in column (3) tends to reinforce the negative coe cient for exposed rms; this con rms the idea that minimum wage increases have been stronger in cities where low-wage rms bene ted from better shocks. Excluding peripheral regions does not change the results.

In our preferred speci cation that includes city-sector xed e ects combined with IV (column 3), the estimates imply that a 10% rise in minimum wage between 2003 and 2005 reduces the probability that an exposed rm survives by 2.1 percentage point. This e ect is economically large: the average di erential in the survival rate of exposed and non-exposed rms being equal to 0.12 percentage points (as reported in Table A-1), the elasticity of this di erential to real minimum wage growth is thus equal to -1.75.[21]

The following tables focus on surviving rms. The results in Table 4 show that minimum wage increases are conducive to upward adjustments in the average wage of surviving rms. Theoretically, rms paying their employees no more than the minimum wage should increase the remuneration of their employees by the exact same rate at which the local minimum wage increases. Hence one would expect an elasticity of one. The expected elasticity would by contrast be lower than one for rms paying in 2003 an average wage that lies between the 2003 local minimum wage and the one imposed in 2005. The estimates reported in Table 4 are consistent with this scenario. The coe cient obtained in our preferred speci cation is 0.36 suggesting that on average, a 10% increase in the local minimum wage leads to a 3.6% increase in the average wage paid by exposed rms. Consequently, the 2004 reform succeeded in increasing signi cantly wages for workers employed by low-wage rms. This is a further proof that the 2004 reform is binding and puts more pressure on low-wage rms.

We investigate in Table 5 the possible repercussions of this non negligible cost shock on the number of employees in surviving rms. Results in column (1) show that employment

[21] This elasticity can be computed as follows: $\frac{0:21 \quad 0:1}{0:12} \quad 10 = \quad 1:75.$

Table 4: Minimum wage and firm average wage

Explained variable	Ln Firm average wage (2003-05)			
	(1)	(2)	(3)	(4)
Estimator			IV estimator	

growth in non-exposed rms is signi cantly higher in cities that increase more their minimum wage: this con rms again that local authorities are less reluctant to increase the level of the minimum wage in cities that face better economic conditions. Regarding exposed rms, results are robust across the various columns. We do not nd any signi cant job losses in the exposed rms that remain active: the employment growth of surviving exposed rms is not signi cantly di erent from the employment growth of surviving non-exposed ones. Hence, exposed rms do not adjust to the increase in the level of the minimum wage by hiring less or ring more workers than the other rms. Our results con rm in the context of a developing country the conclusions of several papers showing the absence of disemployment e ects of minimum wage in developed countries.[22]

Table 5: Minimum wage and firm employment

Explained variable	Ln Firm employment (2003-05)			
	(1)	(2)	(3)	(4)
Estimator			IV estimator w/o periphery	
Ln Real Minimum wage 2003-05	0.218[a]			
	(0.061)			
Ln Real Minimum wage 2003-05 Exposed	-0.029	-0.044	-0.045	-0.052
	(0.043)	(0.036)	(0.042)	(0.045)
Ln Firm employment	-0.105[a]	-0.120[a]	-0.120[a]	-0.120[a]
	(0.004)	(0.004)	(0.004)	(0.005)
Ln Firm wage	0.066[a]	0.098[a]	0.097[a]	0.097[a]
	(0.007)	(0.007)	(0.007)	(0.007)
Ln Firm labor productivity	0.106[a]			

Table 7: Quanti cation of the e ect of minimum wage growth on rm-level outcomes (2003-05)

Outcome	Wage	Employment	Labor productivity
Average Ln Real Minimum wage 2003-05 (=0.22)	0.079	0	0.084
Standard deviation of Ln Real Minimum wage 2003-05 (=0.16)	0.058	0	0.061
Standard deviation of the initial level of the outcome variable	0.257	0.127	0.358

Authors' computations.

In order to further assess how big these e ects are, we consider two groups of exposed rms depending on the magnitude of minimum wage growth in their respective cities. The rst group locates in a city where the growth rate of minimum wage between 2003 and 2005 is equal to the national average (Guangzhou for example where the minimum wage increases by 24% between 2003-2005), while the rms of the other group are in a city where the increase in minimum wage is greater by one-standard deviation. This standard deviation being equal to 0.16, this could be Xian (where minimum wages rose by 38%). This 14 percentage points di erence in minimum wage growth leads to a relative rise in wages and labor productivity by 5.1 and 5.3% for exposed rms located in Xian as compared to those in Guangzhou.

5.3 Robustness checks

In this subsection, we present some robustness checks.

In spite of the introduction of city-sector xed e ects and of our IV strategy, one might still worry that our results are partly explained by speci c shocks a ecting low-wage rms. These shocks might be directly re ected in the evolution of city-level GDP or could be correlated with the composition of the labor force in terms of skills. In Table A-5 in Appendix, we thus alternatively add to our preferred speci cation GDP growth and the share of low-skilled workers in the total number of manufacturing workers in the city (measured in 2004, the information on the number of skilled and unskilled workers being available in the National Business Surveys only for that year), both interacted with the exposure dummy.[26] Results barely change from a qualitative point of view. Only the e ect of minimum wage on rm-level average wage is less precisely estimated when we introduce the interaction between city-level GDP growth and the \exposed" dummy, but the coe cient remains very close to the one obtained in our benchmark speci cation. We thus conclude that our benchmark speci cation adequately controls for endogeneity.

In Table A-6 in Appendix we check that our results are robust to the introduction of polynomials of the rm-level average wage (up to order 5). This check is inspired by a

[26] GDP growth and the share of unskilled workers in the manufacturing labor force are already taken into account by the city-sector xed e ects.

standard practice in regression discontinuity design frameworks (Lee and Lemieux, 2010). We introduce polynomials of the variable used to build the treatment variable (here, the firm-level average wage, used to build the exposure dummy) so as to ensure that the coefficient on the treatment variable is not simply capturing a non-linear relationship between the dependent variable (firm-level performance growth) and the variable used to define the treatment. The results remain qualitatively unchanged for all the outcome variables except for the growth rate of firm-level average wage, for which the effect of minimum wage is still positive but insignificant. However, the specification is very demanding in that case. Overall, the results of this table confirm that the coefficient on the interaction between the exposed dummy and real minimum wage growth captures an actual gap in performance growth between exposed and non-exposed firms.

5.4 Alternative explanations

After having checked that our results are robust to the introduction of additional controls and to various specifications, we now investigate whether the absence of disemployment effect and the productivity-enhancing effect of minimum wage growth can be explained by

in Appendix. Column (1) reports the results of Equation (1) for the total pay per worker computed as the sum of the rm-level average wage and welfare pay per employee. The point estimate is similar to the one we obtained in Table 4 for average wage, suggesting that welfare pay and average wage go hand in hand following the reform. This is con rmed in column (2), which shows that following an increase in the real minimum wage, the ratio of welfare pay over total pay does not change in exposed rms as compared to non-exposed ones.

The analysis of the evolution of city-level unemployment and of the ratio of migrants to residents goes in the same direction. If rms substitute migrants for resident workers, we should observe in cities that increase their minimum wage faster a relative increase in the level of unemployment and/or in the number of migrants as compared to residents in the overall population. Table A-8 in Appendix explores this possibility. We regress in columns (1) and (2) the change in city-level unemployment rate between 2003 and 2005 on local real minimum wage growth and on a bunch of proxies for the initial wealth and attractiveness of the city. In column (2), the growth rate of the city-level minimum wage is instrumented using the two instruments described in section 4.2. Results show that there is no systematic association between the rise in minimum wage and the evolution of the city-level unemployment rate. We do the same in columns (3) to (6) for the ratio of migrants to residents in the overall population and in the working age population respectively. The number of migrants is computed as the number of people without a local residence permit (*hukou*),[27] available at the city-level from the population censuses held in 2000 and 2005. Again, our results suggest that there is no signi cant relationship between the change in the city-level real minimum wage between 2003 and 2005 and the change in the proportion of migrants in the city between 2000 and 2005.

Finally, Du and Pan (2009) study two waves of the China Urban Labor Surveys run in 2001 and 2005 and show that all else equal (in particular controlling for age, skills etc.), the probability that a worker is paid below the level of the hourly minimum wage is higher for migrant workers; however, this di erence in probability between migrant and local workers tends to decrease in 2005 as compared to 2001, suggesting that the \cost advantage" of migrant workers drops following the 2004 reform, in line with the objective of the reform to improve the coverage of migrants in terms of labor standards.

Overall, these rm- and city-level results cast serious doubt on the hypothesis that exposed rms substitute migrants to local workers in order to adjust to the minimum wage increase caused by the reform.

Another related concern is the number of hours worked by the employees of exposed rms.

In order to absorb the cost shock generated by the 2004 reform, the rms, and especially the ones that are the most exposed to the real minimum wage growth, could ask both their local and migrant workers to increase the number of hours they work. Since we observe the number of employees but not the number of hours worked, it could then be the case that the absence of disemployment e ects and the increase in productivity following the 2004 reform re ect in reality an increase in the number of hours worked by the employees of exposed rms. We cannot directly test for such a mechanism. However, Du and Pan (2009) show that the number of hours worked tends to decrease between 2001 and 2005 in China for both migrants and resident workers. In 2001, migrants were working 73.4 hours per week on average in the informal sector and 60.8 hours in the formal sector versus respectively 72.1 and 52.2 hours in 2005. For local workers, these gures are equal to 59.5 in the informal sector and 53.4 hours in the formal sector in 2001, and 44 and 43.5 respectively in 2005. In spite of this decreasing trend in the number of hours worked by employee, our data show that rm-level output per worker increases on average by 23% over the period (46% for exposed rms, 20% for non-exposed ones, much faster in both cases than in ation). This could not be achieved without improvements in rm-level organization or workers' e ciency. In this context the \number of hours" mechanism seems rather implausible.

5.5 Heterogeneous e ect of minimum wage growth

We now go further in the understanding of the e ects of the minimum wage by investigating potential heterogeneous e ects of the 2004 reform along several dimensions.

First, rms that are more intensive in unskilled workers should be more a ected by the increase in the minimum wage. We have information on skills from the National Business Surveys for the year 2004 only. Computing skill intensity at the rm-level would raise endogeneity issues for the econometric analysis. We rather compute the share of unskilled workers in the overall workforce for each city and sector, and we analyze in Table A-9 in Appendix whether the e ect of minimum wage growth varies for above- and below the median city-sectors in terms of worker skill intensity. The results show that there is no signi cant heterogeneity across city-sectors regarding the e ect of minimum wage growth on survival and employment. A rise in the level of minimum wage is equally detrimental to rms in terms of survival probability in low- and high-skill intensive city-sectors, while the e ect on the employment of surviving rms is null in both cases. Things are di erent for rm-level average wage and productivity growth: the elasticity of both variables to minimum wage growth is positive in both types of city-sectors, but it is higher in low-skill intensive city-sectors. This is consistent with the idea that an increase in the level of minimum wage puts more pressure on rms in city-sectors that employ relatively more unskilled workers, as they are more likely to earn low wages.

the fact that minimum wage growth forces some rms to exit the market negatively a ect

Table 8: Minimum wage and components of city-level employment growth

$$\overline{y^c}_{2003\_05} = \underbrace{\sum_{f \in Survivors_c} \theta^f_{2003}\, y^f_{2003\_05}}_{\text{Within}} + \underbrace{\sum_{f \in Survivors_c} \theta^f_{2003\_05}\,[y^f_{2003} - \overline{y^c}_{2003}]}_{\text{Between}} + \underbrace{\sum_{f \in Survivors_c} \theta^f_{2003\_05}\, y^f_{2003\_05}}_{\text{Covariance}} + \underbrace{\sum_{f \in Entrants_c} \theta^f_{2005}\,[y^f_{2005} - \overline{y^c}_{2003}] - \sum_{f \in Exiters_c} \theta^f_{2003}\,[y^f_{2003} - \overline{y^c}_{2003}]}_{\text{Net entry}} \quad (2)$$

Average labor productivity in city c in 2003, $\overline{y^c}_{2003}$, is measured as the weighted average of the labor productivity y^f_{2003} of firms f located in city c (in log), using as weights θ^f_{2003}, the share of firm f in total employment of city c. The first three components in Equation 2 are computed over the population of surviving firms. The first term is the within component, i.e. the productivity growth of surviving firms between 2003 and 2005 keeping their shares constant. The second term is the between component and accounts for the reallocation of labor between firms with different initial productivities. A positive variation reflects a reallocation of labor from initially less efficient firms to initially more efficient ones (as compared to the city-level average). The third term accounts for the covariance between the

Table 9: Minimum wage and components of city-level labor productivity growth

Estimator	IV						
Explained component	Total	Within	Between	Covariance	Net entry	Entry	Exit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Real Minimum wage 2003-05	0.356[b]	0.218[c]	-0.098	-0.063	0.299[b]	0.184	-0.116[c]
	(0.168)	(0.132)	(0.066)	(0.110)	(0.141)	(0.129)	(0.060)
Ln Labor productivity	-0.177[b]	-0.086	-0.067	0.097	-0.120	-0.191[a]	-0.071[b]
	(0.081)	(0.070)	(0.042)	(0.065)	(0.080)	(0.067)	(0.030)
Ln Employment	-0.030	-0.046	0.010	0.068[c]	-0.062[b]	-0.046	0.016[c]
	(0.043)	(0.038)	(0.019)	(0.035)	(0.028)	(0.029)	(0.009)
Ln GDP per capita	0.057	0.056	0.022	-0.083[c]	0.062	0.083[c]	0.021
	(0.058)	(0.051)	(0.027)	(0.044)	(0.048)	(0.045)	(0.016)
Ln Population	0.044	0.015	0.008	-0.034[c]	0.055[b]	0.041[c]	-0.014
	(0.032)	(0.025)	(0.011)	(0.019)	(0.024)	(0.022)	(0.009)
FDI over GDP	-0.047	-0.030	0.015	-0.004	-0.027	-0.012	0.015[c]

As shown in columns (3) and (5), these aggregate e ciency gains come from two main channels: within- rm e ciency gains among survivors and net entry. The rst channel is in line with the rm-level results. The latter one is suggestive of a cleansing e ect of minimum wage: the cost shock induced by the growth of real minimum wage forces the least productive rms to exit and the new entrants to be more productive than the average. However, minimum wage growth does not seem to a ect the allocation of employment across incumbent rms: neither the between nor the covariance terms exhibit a signi cant relationship with the growth of real minimum wage at the city-level. While Hsieh and Klenow (2009) show that the misallocation of resources across incumbent rms is an important source of ine ciency in China, minimum wage regulations do not seem to improve the situation in this respect.

6.3 Quanti cation exercises

Results from column (1) of Table 9 show that the elasticity of aggregate productivity to minimum wage growth is 0.356. This means that the average rise in minimum wage between 2003 and 2005, equal to 21.9%, is associated with a 7.8 percentage point increase in aggregate productivity. The coe cient on initial labor productivity being equal to -0.177, this rise is equivalent to the productivity growth di erential that would arise between two cities whose initial labor productivities di er by 44%. We can compute that a one standard deviation increase in minimum wage growth yields a productivity growth di erential between two cities equal 5.7 percentage points. This is not negligible, equal to roughly a fth of the standard deviation of productivity growth a(ductiv)(a(du(ductiv)(aploe5re0(that)92e9nyh46(ro)(5)1(.7)i26(of)-(resp

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Appendix

Table A-1: Summary statistics on exposure and wage evolution

Firm type	Exposed	Non-exposed
Number present in our sample in 2003	35,659	131,668
of which alive in 2005	23,356	102,423
Survival rate	0.66	0.78
Surviving firms		
Mean $\ln wage_{2003\_05}$	0.92	0.13
Median $\ln wage_{2003\_05}$	0.73	0.13
s.d. $\ln wage_{2003\_05}$	0.84	0.50
Mean $\ln$ labor productivity$_{2003_05}$	0.46	0.20
s.d. $\ln$ labor productivity$_{2003_05}$	0.20	0.65
Mean $\ln employment_{2003\_05}$	0	0.01
s.d. $\ln employment_{2003\_05}$	0.62	0.51
All firms		
Mean $\ln$ Minimum wage$_{2003_05}$	0.26	0.24
s.d. $\ln$ Minimum wage$_{2003_05}$	0.11	0.10
Mean $\ln$ Real Minimum wage$_{2003_05}$	0.20	0.19
s.d. $\ln$ Real Minimum wage$_{2003_05}$	0.11	0.09

Authors' computations from the 2003 and 2005 NBS annual surveys. Real minimum wages are computed using provincial price indices. Refer to main text for details.

Table A-2: Determinants of firm-level exposure to minimum wage changes (2003-05)

Explained variable	Firm exposure dummy		
	(1)	(2)	(3)
Sample			w/o outlier
Ln Firm employment	-0.023[a]	0.030[a]	-0.024[a]

Table A-4: Minimum wage and other rm-level outcomes

Explained variable	Firm outcome (2003-05)					
	(1)	(2)	(3)	(4)	(5)	(6)
Firm outcome	Ln TFP		pro t over output		Ln output	
	OLS	IV	OLS	IV	OLS	IV
Ln Real Minimum wage 2003-05 Exposed	0.329[a]	0.488[a]	0.114	0.157	0.236[a]	0.336[a]
	(0.085)	(0.100)	(0.096)	(0.135)	(0.055)	(0.054)
Ln Firm employment	0.188[a]	0.189[a]	0.006[c]	0.006[c]	-0.089[a]	-0.089[a]
	(0.011)	(0.011)	(0.004)	(0.004)	(0.007)	(0.007)
Ln Firm wage	0.111[a]	0.125[a]	0.019	0.023	0.030[b]	0.039[a]
	(0.021)	(0.022)	(0.018)	(0.021)	(0.012)	(0.012)
Ln Firm TFP	-0.435[a]	-0.436[a]				
	(0.013)	(0.013)				
Ln Firm labor productivity			0.030[b]	0.030[b]	-0.169[a]	-0.169[a]
			(0.012)	(0.012)	(0.011)	(0.011)
Firm pro t over output			-0.849[a]	-0.849[a]		
			(0.131)	(0.131)		
State dummy	-0.336[a]	-0.337[a]	-0.311	-0.311	-0.251[a]	-0.251[a]
	(0.024)	(0.024)	(0.208)	(0.208)	(0.022)	(0.022)
Foreign dummy	0.077[a]	0.076[a]	0.023	0.022	0.065[a]	0.065[a]
	(0.015)	(0.014)	(0.022)	(0.022)	(0.013)	(0.013)
Export dummy	0.017[c]	0.017[c]	0.015	0.015	0.027[a]	0.027[a]
	(0.010)	(0.010)	(0.015)	(0.015)	(0.010)	(0.010)
City-Sector Fixed e ects	yes	yes	yes	yes	yes	yes
R-squared	0.17	0.17	0.01	0.01	0.05	0.05
Observations	110,556		112,171		112,171	
Underidenti cation test		62.6[a]		62.5[a]		62.5[a]
First-stage F test of excluded instruments		431[a]		428[a]		428[a]
Overidenti cation Hansen J statistic		0.19		0.30		0.06
Chi-sq(1) (p-value)		0.66		0.58		0.81

Labor productivity is computed as output value per employee. Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the city level. [a], [b] and [c] indicate signi cance at the 1%, 5% and 10% con dence level. Exposed is a dummy that indicates that the average wage in the rm in 2003 is lower than the local minimum wage in 2005. indicate variation between 2003 and 2005. All other right-hand side variables are measured in 2003. Instruments used in the IV procedure of Ln Minimum wage 2003-05 Exposed in columns (2), (4) and (6) are the interactions of the local minimum wage in 2003 and the predicted minimum wage change based on the 40% rule (see text) with the exposed dummy. The underidenti cation test is based on the Kleibergen-Paap rk LM statistic, with [a] indicating that the p-value (Chi-sq(2)) is below 0.01 suggesting that underidenti cation is rejected. The F test of excluded instruments in the rst stage equation is based on the Kleibergen-Paap Wald rk F statistic, with [a] indicating that the p-value is below 0.01 suggesting that the instruments are not weak. The F-statistic on the excluded instruments is ex/7J ET q 1 0 0 -373(the)-372(predicted)-372(m)-1(in)1n4(ex/a3w085))-1239((0.100))]TJ ET q 1 0 0 1

Table A-5: Robustness checks: city-level controls

Explained variable	Firm outcome (2003-05)									
Estimator	IV estimator									
Outcome	Survival		Ln average wage		Ln Employment		Ln labor productivity		Pro t over output	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ln Real Minimum wage 2003-05 Exposed	-0.175[a]	-0.131[b]	0.271	0.646[a]	0.005	0.047	0.366[a]	0.266[b]	0.137	0.067
	(0.053)	(0.066)	(0.179)	(0.190)	(0.068)	(0.085)	(0.135)	(0.110)	(0.140)	(0.097)
Ln city GDP per capita Exposed	-0.022		0.061		-0.034		0.010		0.010	
	(0.031)		(0.073)		(0.038)		(0.080)		(0.014)	
Ln city skill intensity Exposed		0.126		0.478[b]		0.154		-0.191		-0.142[c]
		(0.105)		(0.238)		(0.124)		(0.162)		(0.080)
Ln Firm employment	0.081[a]	0.081[a]	0.052[a]	0.052[a]	-0.120[a]	-0.120[a]	0.031[a]	0.031[a]	0.001	0.001
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)
Ln Firm wage	0.020[a]	0.020[a]	-0.761[a]	-0.763[a]	0.097[a]	0.097[a]	-0.059[a]	-0.058[a]	0.019	0.019
	(0.004)	(0.004)	(0.031)	(0.031)	(0.007)	(0.007)	(0.012)	(0.011)	(0.020)	(0.021)
Ln Firm labor productivity	0.053[a]	0.053[a]	0.092[a]	0.092[a]	0.117[a]	0.117[a]	-0.286[a]	-0.286[a]	0.012	0.012
	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)	(0.012)	(0.012)	(0.010)	(0.010)
Export dummy	0.028[a]	0.028[a]	0.017[b]	0.017[b]	0.047[a]	0.047[a]	-0.019[a]	-0.019[a]	0.021	0.021
	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.008)	(0.017)	(0.017)
State dummy	-0.098[a]	-0.098[a]	0.062[a]	0.062[a]	-0.061[a]	-0.060[a]	-0.193[a]	-0.192[a]	-0.267	-0.267
	(0.018)	(0.018)	(0.019)	(0.018)	(0.011)	(0.011)	(0.025)	(0.025)	(0.200)	(0.199)
Foreign dummy	0.028[a]	0.028[a]	0.167[a]	0.167[a]	0.014[c]	0.014[c]	0.051[a]	0.051[a]	0.026	0.026
	(0.006)	(0.006)	(0.020)	(0.020)	(0.007)	(0.007)	(0.011)	(0.011)	(0.022)	(0.022)
City-Sector Fixed e ects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.06	0.06	0.47	0.47	0.12	0.12	0.14	0.14	0.00	0.00
Observations	152,066	152,226	112,079	112,171	112,079	112,171	112,079	112,171	112,079	112,171
Underidenti cation test	35.6[a]	35.6[a]	35.6[a]	35.6[a]	35.6[a]	35.6[a]	35.6[a]	35.6[a]	35.6[a]	35.6[a]
First-stage F test of excluded instruments	112[a]	112[a]	112[a]	112[a]	112[a]	112[a]	112[a]	112[a]	112[a]	112[a]
Overidenti cation Hansen J statistic	0.07	0.01	0.17	0.06	1.70	2.18	1.89	2.53	0.69	0.42
Chi-sq(1) (p-value)	0.80	0.94	0.68	0.80	0.19	0.14	0.17	0.11	0.41	0.52

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the city level. [a], [b] and [c] indicate signi cance at the 1%, 5% and 10% con dence level. Exposed is a dummy that indicates that the average wage in the rm in 2003 is lower than the local minimum wage in 2005. indicate variation between 2003 and 2005. All other right-hand side variables are measured in 2003. Instruments used in the IV procedure of Ln Minimum wage 2003-05 Exposed are the interactions of the local minimum wage in 2003 and the predicted minimum wage change based on the 40% rule (see text) with the exposed dummy. The underidenti cation test is based on the Kleibergen-Paap rk LM statistic, with [a] indicating that the p-value (Chi-sq(2)) is below 0.01 suggesting that underidenti cation is rejected. The F test of excluded instruments in the rst stage equation is based on the Kleibergen-Paap Wald rk F statistic, with [a] indicating that the p-value is below 0.01 suggesting that the instruments are not weak. The F-statistic on the excluded instruments is largely above 10, the informal threshold suggested by Staiger and Stock (1997) to assess the validity of instruments. The Hansen J statistic is an overidenti cation test of all instruments, a Chi-sq(1) (p-value) above 0.10 suggests that the model is overidenti ed and the instruments are exogenous.

Table A-6: Robustness checks: wage polynomial

Explained variable		Firm outcome (2003-05)				
Estimator		IV estimator				
Outcome		Survival	Ln av. wage	Ln Employment	Ln labor productivity	Pro t over output
		(1)	(2)	(3)	(4)	(5)
Ln Real Minimum wage 2003-05	Exposed	-0.128[a]	0.070	-0.044	0.155[a]	0.045
		(0.031)	(0.047)	(0.048)	(0.055)	(0.066)
Ln Firm average wage		0.023	-0.906[a]	0.268	-0.050	-0.157
		(0.041)	(0.162)	(0.280)	(0.216)	(0.117)
Ln Firm average wage^2		-0.089[a]	0.096	-0.181	0.223[b]	0.164[c]
		(0.017)	(0.115)	(0.124)	(0.105)	(0.099)
Ln Firm average wage^3		0.028[a]	-0.058[c]	0.046[c]	-0.082[a]	-0.045[c]
		(0.004)	(0.031)	(0.026)	(0.023)	(0.027)
Ln Firm average wage^4						

Table A-7: Alternative explanations: minimum wage, average wage and welfare pay

Explained variable	Firm outcome (2003-05)
Estimator	IV estimator

Table A-9: Differential effect for low-skill and high-skill intensive city-sectors

Explained variable	Firm outcome (2003-05)							
Estimator	IV estimator							
Outcome	Survival		Ln average wage		Ln Employment		Ln labor productivity	
	Low	High	Low	High	Low	High	Low	High
Ln Real Minimum wage 2003-05 Exposed	-0.221[a]	-0.200[a]	0.493[a]	0.195[b]	-0.076	-0.016	0.461[a]	0.278[a]
	(0.038)	(0.036)	(0.141)	(0.091)	(0.062)	(0.049)	(0.074)	(0.061)
Ln Firm employment	0.075[a]	0.087[a]	0.062[a]	0.039[a]	-0.117[a]	-0.124[a]	0.038[a]	0.022[a]
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.007)	(0.006)
Ln Firm wage	0.022[a]	0.016[a]	-0.728[a]	-0.806[a]	0.091[a]	0.103[a]	-0.048[a]	-0.075[a]
	(0.004)	(0.005)	(0.036)	(0.024)	(0.008)	(0.010)	(0.015)	(0.011)
Ln Firm labor productivity	0.053[a]	0.055[a]	0.093[a]	0.089[a]	0.120[a]	0.114[a]	-0.284[a]	-0.292[a]
	(0.003)	(0.004)	(0.006)	(0.007)	(0.006)	(0.007)	(0.012)	(0.014)
Export dummy	0.022[a]	0.033[a]	0.016[b]	0.016[c]	0.056[a]	0.039[a]	-0.007	-0.032[a]
	(0.007)	(0.006)	(0.007)	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)
State dummy	-0.094[a]	-0.112[a]	0.076[a]	0.020	-0.055[a]	-0.075[a]	-0.182[a]	-0.211[a]
	(0.021)	(0.016)	(0.020)	(0.021)	(0.011)	(0.021)	(0.027)	(0.033)
Foreign dummy	0.027[a]	0.027[a]	0.191[a]	0.149[a]	0.006	0.021[b]	0.076[a]	0.031[a]
	(0.008)	(0.007)	(0.025)	(0.017)	(0.009)	(0.010)	(0.016)	(0.011)
City-Sector Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.06	0.06	0.45	0.49	0.13	0.12	0.14	0.15
Observations	76,573	73,605	57,474	54,200	57,474	54,200	57,474	54,200
Underidentification test	56.2[a]	59.3[a]	55.8[a]	57.8[a]	55.8[a]	57.8[a]	55.8[a]	57.8[a]
First-stage F test of excluded instruments	312[a]	520[a]	318[a]	528[a]	318[a]	528[a]	318[a]	528[a]
Overidentification Hansen J statistic	0.80	0.35	0.11	0.01	1.05	0.92	1.21	1.08
Chi-sq(1) (p-value)	0.37	0.56	0.74	0.96	0.31	0.34	0.27	0.30

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the city level. [a], [b] and [c] indicate significance at the 1%, 5% and 10% confidence level. Exposed is a dummy that indicates that the average wage in the firm in 2003 is lower than the local minimum wage in 2005. indicate variation between 2003 and 2005. All other right-hand side variables are measured in 2003. Instruments used in the IV procedure of Ln Minimum wage 2003-05 Exposed are the interactions of the local minimum wage in 2003 and the predicted minimum wage change based on the 40% rule (see text) with the exposed dummy. The underidentification test is based on the Kleibergen-Paap rk LM statistic, with [a] indicating that the p-value (Chi-sq(2)) is below 0.01 suggesting that underidentification is rejected. The F test of excluded instruments in the first stage equation is based on the Kleibergen-Paap Wald rk F statistic, with [a] indicating that the p-value is below 0.01 suggesting that the instruments are not weak. The F-statistic on the excluded instruments is largely above 10, the informal threshold suggested by Staiger and Stock (1997) to assess the validity of instruments. The Hansen J statistic is an overidentification test of all instruments, a Chi-sq(1) (p-value) above 0.10 suggests that the model is overidentified and the instruments are exogenous.

Table A-10: Di erential e ect depending on rm-level exposure intensity

Explained variable	Firm outcome (2003-05)				
Estimator	IV estimator				
Outcome	Survival	Ln average wage	Ln Employment	Ln labor productivity	Pro t over output
	(1)	(2)	(3)	(4)	(5)
Ln Real Minimum wage 2003-05 "above median" Exposed	-0.375[a]	1.179[a]	0.037	0.706[a]	0.273
	(0.048)	(0.203)	(0.063)	(0.095)	(0.235)
Ln Real Minimum wage 2003-05 "below median" Exposed	-0.140[a]	0.068	-0.081[b]	0.269[a]	0.107
	(0.029)	(0.076)	(0.039)	(0.053)	(0.098)
Ln Firm employment	0.081[a]	0.051[a]	-0.120[a]	0.031[a]	0.001
	(0.003)	(0.003)	(0.004)	(0.006)	(0.003)
Ln Firm wage	0.010[b]	-0.716[a]	0.102[a]	-0.041[a]	0.025
	(0.004)	(0.033)	(0.007)	(0.013)	(0.026)
Ln Firm labor productivity	0.053[a]	0.088[a]	0.117[a]	-0.288[a]	0.011
	(0.003)	(0.005)	(0.005)	(0.011)	(0.010)
Export dummy	0.028[a]	0.016[b]	0.047[a]	-0.020[a]	0.021
	(0.005)	(0.007)	(0.006)	(0.007)	(0.017)
State dummy	-0.097[a]	0.050[a]	-0.061[a]	-0.196[a]	-0.268
	(0.018)	(0.018)	(0.011)	(0.025)	(0.200)
Foreign dummy	0.030[a]	0.158[a]	0.013[c]	0.047[a]	0.025
	(0.006)	(0.019)	(0.007)	(0.011)	(0.021)
City-Sector Fixed e ects	yes	yes	yes	yes	yes
R-squared	0.06	0.47	0.12	0.14	0.01
Observations	152,226	112,171	112,171	112,171	112,171
Underidenti cation test	63.9[a]	61.0[a]	61.0[a]	61.0[a]	61.0[a]
First-stage F test of excluded instruments	189[a]	192[a]	192[a]	192[a]	192[a]
Overidenti cation Hansen J statistic	2.05	0.43	1.54	2.14	4.40

Table A-11: Di erential e ect depending on rm ownership

Explained variable	Firm outcome (2003-05)
Estimator	IV estimator
Outcome	

Figure 1: Monthly minimum wage in 2003 (yuan)

Figure 4: Correlation between Monthly minimum wage 2003-05 and labor productivity in 2003